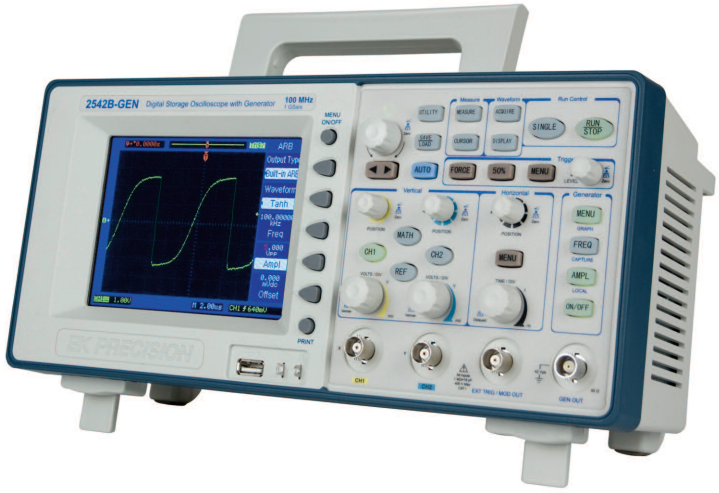
Data Sheet

Digital Storage Oscilloscopes

Models 2540B, 2542B, 2540B-GEN, 2542B-GEN



The 2540B, 2542B, 2540B-GEN, and 2542B-GEN dual channel 60 MHz and 100 MHz digital storage oscilloscopes deliver performance and value, all in one portable solution. Maximize productivity using extensive features such as digital filtering, waveform recorder, pass/fail limit testing, and automatic measurements. These oscilloscopes offer powerful tools in a small affordable package with deep waveform memory up to 2.4 Mpts plus LAN and USB PC interface. The 2540B-GEN and 2542B-GEN models add a built-in function/arbitrary waveform generator (AWG).

Easily capture, save, and analyze measurement results with Comsoft PC software. All scope parameters can be controlled via a PC without the need for programming or communicate with the DSO via the built-in LAN interface using a web browser.

Additionally, these oscilloscopes can be integrated with AWGs using B&K Precision's waveform editing software, WaveXpress. WaveXpress allows users to easily modify waveforms downloaded from the scope and can also be used for analysis of deep memory acquisitions.

Educators will appreciate the ability to disable the Auto Set button that would automatically setup the scope to display a signal, circumventing the need to know how to set up scope parameters. This is key for teaching waveform measurement fundamentals as if it was an analog oscilloscope.

These oscilloscopes are ideal for applications in design and debugging, service and repair, and education.

Features and Benefits

- 60 MHz (2540B/2540B-GEN) and 100 MHz (2542B/2542B-GEN) bandwidth
- 1 GSa/s sample rate
- Deep waveform memory up to 2.4 Mpts[1]
- 28 automatic measurements
- Four different math functions – Add, Subtract, Multiply, and FFT
- Pulse width, video, slope and alternate triggering
- Advanced tools include digital filter with adjustable limits, pass/fail testing, and wave form recorder mode
- Four shortcut keys for quick access of frequently used functions (models 2540B and 2542B only)
- Built-in Function/Arbitrary Waveform Generator (models 2540B-GEN and 2542B-GEN only)
- 11 different language user interfaces
- Built-in context sensitive help system
- For educators - ability to disable the Auto Set button
- LAN and USB connectivity for remote PC control through Comsoft PC software[2] or custom software using SCPI commands
- USB host port for convenient storing and recalling of waveform data, setups, and screenshots on a USB flash drive
- LAN interface for capturing screenshots via a web browser plus full front panel emulation

[1]-Based on sample rate and accessible via remote interface
[2]-Available for download at the B&K Precision website

Models	2540B	2542B	2540B-GEN	2542B-GEN
Bandwidth	60 MHz	100 MHz	60 MHz	100 MHz
Built-In AWG	No	No	Yes, 20 MHz	Yes, 40 MHz

WaveXpress™ Compatible

For more information, visit www.bkprecision.com/WaveXpress

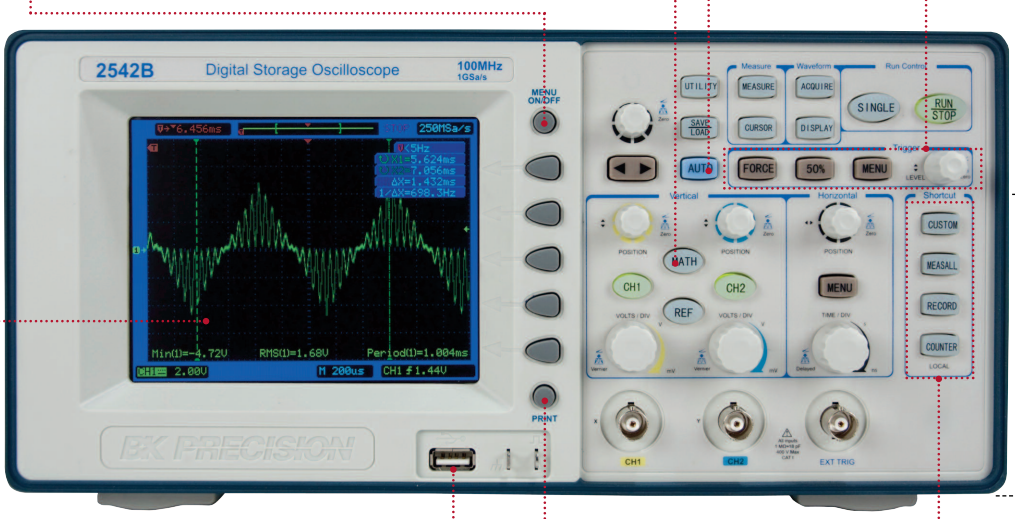
Front panel

Menu On/Off button
Configure the menu parameters and hide the menu with the push of a button to view your signal in full screen.

Waveform analysis with math and FFT
Analyze your signals with add, subtract, and multiply functions. View the signal's frequency spectrum and perform harmonic distortion analysis.

Auto Set button
Vertical, horizontal, and trigger controls are automatically adjusted for fast signal display.

Advanced triggering
Isolate the signal with advanced triggering including pulse width and selectable video trigger.



Built-in arbitrary waveform generator (models 2540B-GEN and 2542B-GEN only)

Optimize your workspace and increase productivity with the unique combination of a DSO and a built-in AWG.

Display
5.7" color display.

USB host port
Connect your USB flash drive to conveniently update firmware and store/recall waveform data, setups, and screenshots.

Print button
Simply press the Print button to save a screenshot in bitmap format to a USB flash drive.

Shortcut buttons (models 2540B and 2542B only)
Use these buttons to quickly access your most frequently used functions or menus. The Custom button allows you to assign your own shortcut.

Rear panel

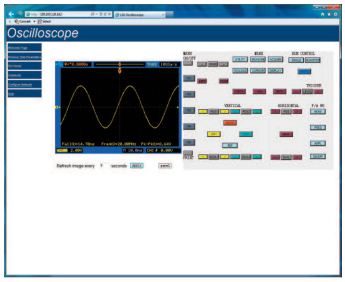
Security loop
Use the built-in security loop to secure your instrument to your location.

AC Input Socket
Input socket for the AC power cord.

Communication
LAN, RS232, and USB ports enable remote PC control.

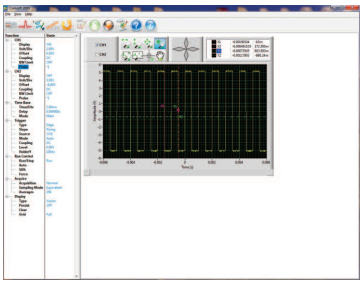
The tools you need

Web-Enabled



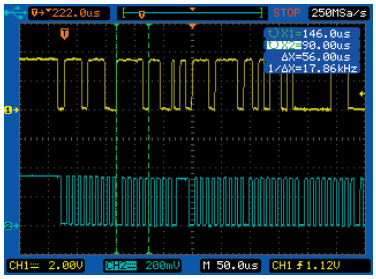
The built-in LAN interface allows you to easily capture screenshots at a user-configurable refresh rate with a web browser. A GUI simulating the front panel provides full DSO control. This feature can be useful in an education setting.

PC Connectivity



Comsoft software provides seamless integration between the oscilloscope and PC. Capture and transfer waveforms, screen images, setups, and measurement results to a Windows PC via the LAN and USB device port on the back of the instrument. A USB host port on the front allows for quick and easy screen saving to a USB flash drive.

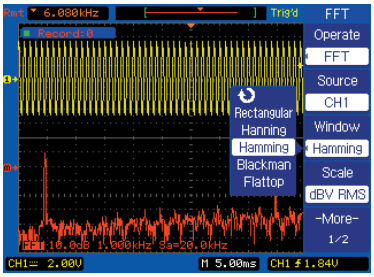
Deep Memory



Beneficial for applications such as I^2C serial data streams, deep memory lets you capture waveforms in high resolution while maintaining a high sample rate over a longer period of time. Up to 2.4 Mpts of memory can be captured in as fast as 5 seconds* using binary transfer through the LAN or USB interface.

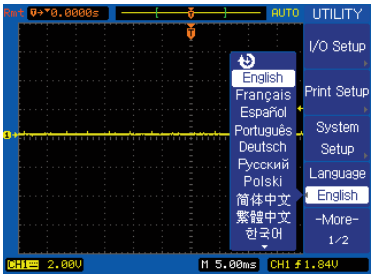
*Typical time based on LAN speed testing.

Powerful Measurement Functions



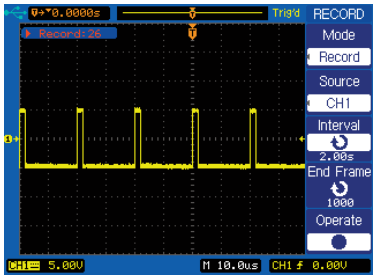
Display and measure the input signal's frequency spectrum. Select one of the 5 FFT windows: Rectangular, Hanning, Hamming, Blackman, and Flattop. Use cursors to measure the spectral component's magnitude and frequency.

Multi-Language Interface



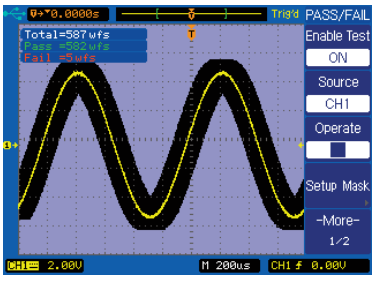
Operate the oscilloscope in a language you understand best with the built-in multi-language interface. Choose from English, Simplified Chinese, Traditional Chinese, Korean, Japanese, French, German, Russian, Spanish, Portuguese, and Polish.

Waveform Recorder



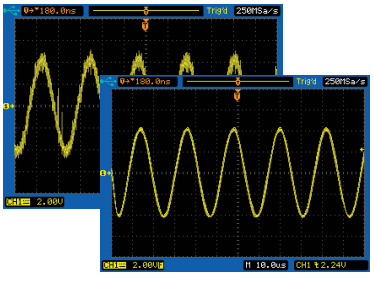
Monitor and analyze long-term signal behavior by recording data continuously over an extensive period of time and playing it back for post acquisition analysis. Data is recorded in a sequence of up to 1000 frames.

Pass/Fail Testing



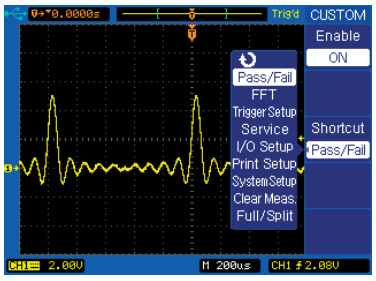
Generate user-defined pass/fail limits to quickly identify go/no go test results.

Digital Filtering



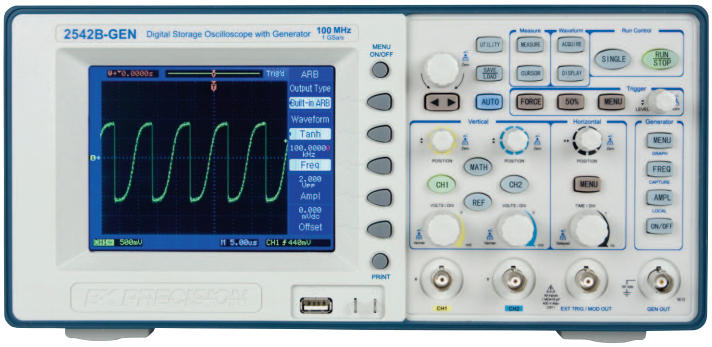
Filter out unwanted signal components such as various types of noise with built-in digital filters. Choose from Low-Pass, High-Pass, Band-Pass, and Band-Stop filters.

Custom Shortcut Key (Models 2540B and 2542B only)



Generate your own shortcut key from the shortcut menu to quickly access your most frequently used function.

Arbitrary Waveform Generator Features for Models 2540B-GEN and 2542B-GEN

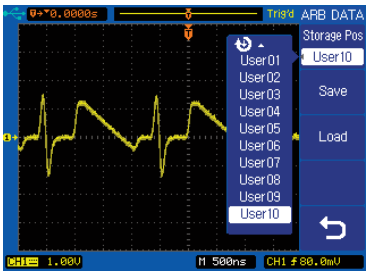


Great for education labs, research, and manufacturing environments, the 2540B-GEN and 2542B-GEN help save bench space and cost by combining 2 instruments in 1. These models provide users a high performance DSO with a full-featured Function/Arbitrary Waveform Generator in a compact and affordable package.

- 1 μHz to 20 MHz Sine Output (2540B-GEN)
  1 μHz to 40 MHz Sine Output (2542B-GEN)
- 1 μHz to 20 MHz Square Output
- 1 mHz to 10 MHz Pulse Output
- Frequency Sweep and Burst Mode
- Output protected against short circuit

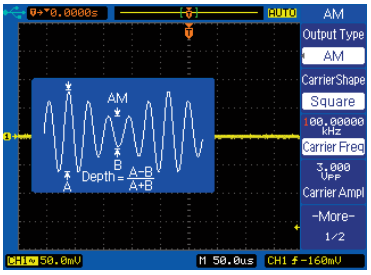
Capture and Storage Function

Quick and easy single-button capture function lets you acquire and store your signal directly from the oscilloscope's channels to the generator's internal memory. Not only can CH1 and CH2 signals be captured, but math functions applied to the channels can also be captured and stored.



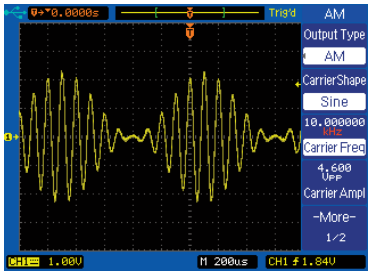
Store user arbitrary waveforms internally (up to 10 waveforms) or externally as an ARB or CSV file to a USB flash drive.

Graphical Help Feature



Display a graphical illustration explaining the parameters of the built-in arbitrary waveforms and modulation schemes. This is a convenient tool for students and new users.

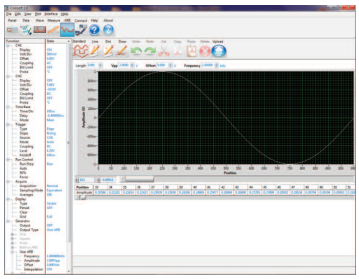
Wide Array of Modulation Schemes



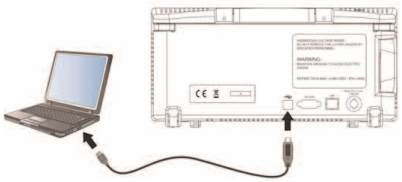
The built-in arbitrary waveform generator is capable of many different types of modulation for various applications. Modulate your waveforms with AM, FM, FSK, PSK, and PWM modulation schemes and use any of the 30 built-in waveforms as the modulating waveform.

Multiple Ways to Interface

Save and load arbitrary waveform data in CSV format from a USB flash drive.

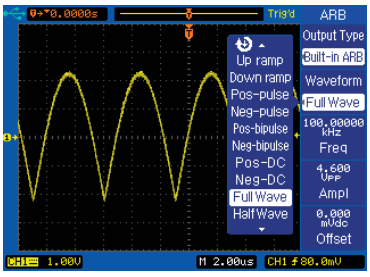


Generate, edit, and upload arbitrary waveforms to the scope using the intuitive Comsoft PC software.



Remotely connect to the scope and download waveform data from custom software using SCPI commands.

30 Built-In Arbitrary Waveforms



Take advantage of the generator's already built-in waveforms that fit your application.

Digital Storage Oscilloscope Specifications

Model	2540B/2540B-GEN	2542B/2542B-GEN
Performance Characteristics		
Bandwidth	60 MHz	100 MHz
Real Time Sampling Rate	Single Channel: 1 GSa/s Dual Channel: 500 MSa/s	
Channels	2	
Rise time	<5.83 ns	<3.50 ns
Max Memory Depth (based on sample rate)	1 GSa/s: 16 kpts 500 MSa/s: 8 kpts (dual channel) 500 MSa/s: 2.4 Mpts* (single channel) ≤ 250 MSa/s: 1.2 Mpts* (single and dual channel) *Maximum number of points can only be extracted via remote control using the USB, RS232C, or LAN interface.	
Vertical Resolution	8 bits	
Vertical Sensitivity	2 mV/div -5 V/div (1-2-5 order)	
DC Gain Accuracy	10 mV/div to 5 V/div: ±3.0% 2 mV/div, 5 mV/div: ±4.0%	
Maximum input voltage	400 V (DC+AC PK-PK, 1 MΩ input impedance, X10), CAT I	
Position Range	±8 divisions away from the center of the screen	
Bandwidth Limit	20 MHz selectable	
Horizontal Scan Range	2 ns/div to 50 s/div	
Timebase Accuracy	±0.01 %	
Input Coupling	AC, DC, GND	
Input Impedance	1 MΩ || 18 pF	
Vertical and Horizontal Zoom	Vertically or horizontally expand or compress a live or stopped waveform	
I/O Interface		
USB	USB host port for flash drives, USB device port for remote control via PC and Comsoft software	
RS232	Remote control via PC and Comsoft software	
LAN	Remote control via web browser or PC and Comsoft software	
Pass/Fail	Pass/Fail output	
Acquisition Modes		
Normal	Display sample data only	
Peak Detect	Capture the maximum and minimum values of a signal	
Average	Waveform averaged, selectable from 2, 4, 8, 16, 32, 64, 128, 256	
Trigger System		
Trigger Types	Edge, Pulse Width, Video* *Support signal Formats: PAL/SECAM, NTSC Trigger condition : odd field, even field, all lines, or line number	
Trigger Modes	Auto, Normal, Single	
Trigger Coupling	AC, DC, LF reject, HF reject	
Trigger Source	CH1, CH2, EXT, EXT/5, AC Line, Alternating	
Pulse Width Trigger	Trigger Modes: Positive Pulse (>,<,=), Negative Pulse (>,<,=)	
Slope Trigger	Time: 20 ns-10 s	
Alternative Trigger	CH1 trigger type: Edge, Pulse, Video, Slope CH2 trigger type: Edge, Pulse, Video, Slope	

Hardware Frequency Counter	
Reading resolution	5 digits
Range	up to oscilloscope's maximum bandwidth
Waveform Math and Automatic Measurements	
Math operation	Add, Subtract, Multiply, FFT
FFT	Window mode: Rectangular, Hanning, Hamming, Blackman, Flattop Sampling points: 1024
Measurements	Max, Min, VPP, High, Low, Amplitude, Average, RMS, Overshoot, Preshoot, Cycle average, Cycle RMS, Frequency, Period, Rise time, Fall time, +Width, -Width, +Duty, -Duty, Delay, Phase, X at MAX, X at MIN
Cursors	
Types	Voltage, Time
Measurements	ΔV, ΔT, 1/ΔT (frequency)
Auto Set	
Function	Single button automatic setup of both channels for vertical, horizontal and trigger system. Can be disabled for training purposes
Requirements	Minimum voltage >10 mVpp, 0.5% duty cycle and minimum frequency >50 Hz
Display System	
Display	5.7 in. Color TFT, 320 x 234 resolution, 24-bit true color
Wave display range	8 x 12 div
Wave display mode	Dots, Vector
Persistence	Off, Infinite
Waveform interpolation	Sin(x)/x, Linear
Color mode	Normal, Inverted
Environmental and Safety	
Temperature	Operating: 32° F to 104 °F (0 °C to +40 °C) Non-operating: -4 °F to 131 °F (-20 °C to +55 °C)
Humidity	Maximum 80% R.H. for temperatures up to 87.8 °F (31 °C), decreasing linearly to 50% R.H. at 104 °F (40 °C)
Altitude	Operating: 9,842.5 ft (3,000 m) Non-operating: 49,212.6 ft (15,000 m)
Electromagnetic Compatibility	Meets EMC Directive 2004/108/EC, meets EN61326 Class A
Safety	EN61010-1:2001, EU Low Voltage Directive 2006/95/EC
General	
Power Requirements	100-240 VAC, CAT II, 50 VA max, 47 Hz to 440 Hz
Dimensions (WxHxD)	12.6" x 6.16" x 4.84" (320 x 156.5 x 123 mm)
Weight	6.2 lbs. (2.81 kg)
Three-Year Warranty	
Supplied Accessories: User manual, two 150 MHz 10:1 passive probes (model PR37A), power cord, USB interface cable, and certificate of calibration. One BNC-to-BNC cable (for models 2540B-GEN and 2542B-GEN only)	

Function/Arbitrary Waveform Generator Specifications

These specifications apply to models 2540B-GEN and 2542B-GEN only.

Models 2540B-GEN & 2542B-GEN	
Frequency Characteristics	
Sine	1 μHz to 20 MHz (2540B-GEN) 1 μHz to 40 MHz (2542B-GEN)
Square	1 μHz to 20 MHz
Pulse	1 mHz to 10 MHz
Built-in AWG	1 mHz to 1 MHz
User AWG	1 mHz to 1 MHz
Frequency resolution	Sine, Square: 1 μHz Pulse, Built-in ARB, User ARB: 1 mHz
Frequency accuracy	≤ ± 5 x 10^{-4}
Frequency stability	± 5 x 10^{-5}
Waveform Characteristics	
Harmonic distortion (sine)	< 5 MHz: -50 dBc ≤ 10 MHz: -45 dBc >10 MHz: -40 dBc
Rise / Fall time (square, pulse)	< 20 ns
Duty cycle (pulse)	10% to 90% (at 10 MHz) 0.01% to 99.99% (below 10 kHz)
Pulse width	10 ns to 999.99 s
Arbitrary	
Waveform length	8000 points
Vertical resolution	8 bits
Sampling rate	40 MSa/s
Non-volatile memory	10 waveforms storage capability
Built-in arbitrary waveforms	Sine, Square, Triangle, Up ramp, Down ramp, Positive pulse, Negative pulse, Positive double pulse, Negative double pulse, Positive DC, Negative DC, Full Wave, Half Wave, Clipped Sine, Gate Sine, SQRT, Exponential, Log, Semicircle, Tanh, Sinc, Noise, Duty 10%, Duty 90%, Up Step, Down Step, Tri-pulse, Trapezoidal, Cosine, and SCR
Amplitude Characteristics	
Generator Output (GEN OUT)	
Amplitude range	freq. ≤ 20 MHz: 2 mVpp to 20 Vpp (open circuit), 1 mVpp to 10 Vpp (50 Ω) freq. > 20 MHz: 2 mVpp to 6 Vpp (open circuit), 1 mVpp to 3 Vpp (50 Ω)
Resolution	1 μVpp (max.)
Accuracy	≤ ± 5% ±1 mV @ 1 kHz sine waveform
Flatness	freq. ≤ 5 MHz: ± 5% freq. > 5 MHz: ± 10%
Flatness (built-in AWG, user AWG)	freq. ≤ 50 kHz: ± 5% freq. > 50 kHz: ± 20%
Output impedance	50 Ω
Modulating Waveform Output (MOD OUT)	
Waveforms	All 30 built-in arbitary waveforms
Output amplitude	5 Vpp ± 20%
Output impedance	600 Ω

AM, FM, PWM, and DCOM Modulation Characteristics	
Carrier waveforms	Sine, Square (AM, FM, DCOM)
	Pulse (PWM)
Modulating waveforms	All 30 built-in arbitrary waveforms
Modulation frequency	1 mHz to 1 MHz
AM modulation depth	0% to 120%
FM Frequency deviation	0.1% to 99.9%
PWM Width deviation	1% to 99%
FSK Modulation Characteristics	
Carrier waveform	Sine
Hop frequency	1 μHz to 40 MHz
Interval time	1 ms to 40 s
PSK Modulation Characteristics	
Carrier waveform	Sine
Hop phase	0° to 360°
Interval time	1 ms to 40 s
Frequency Sweep Characteristics	
Waveforms	Sine, Square
Frequency range	1 μHz to 20 MHz (2540B-GEN) 1 μHz to 40 MHz (2542B-GEN)
Sweep mode	Linear Up, Down, Up-Down
Sweep time	1 ms to 500 s
Burst Characteristics	
Waveforms	All 30 built-in arbitrary waveforms
Counts	1 to 60000 cycles
Burst rate	1 mHz to 1 MHz